Announcements

- EXAMs will be returned ??
- Homework for tomorrow…

  Ch. 29: CQ 1, Probs. 2, 4, & 35

- Office hours…

  MW 10-11 am
  TR 9-10 am
  F 12-1 pm

- Tutorial Learning Center (TLC) hours:

  MTWR 8-6 pm
  F 8-11 am, 2-5 pm
  Su 1-5 pm

Chapter 29

Potential & Field

(*Connecting Potential and Field & Sources of Electric Potential*)

29.1:
Connecting Potential & Field

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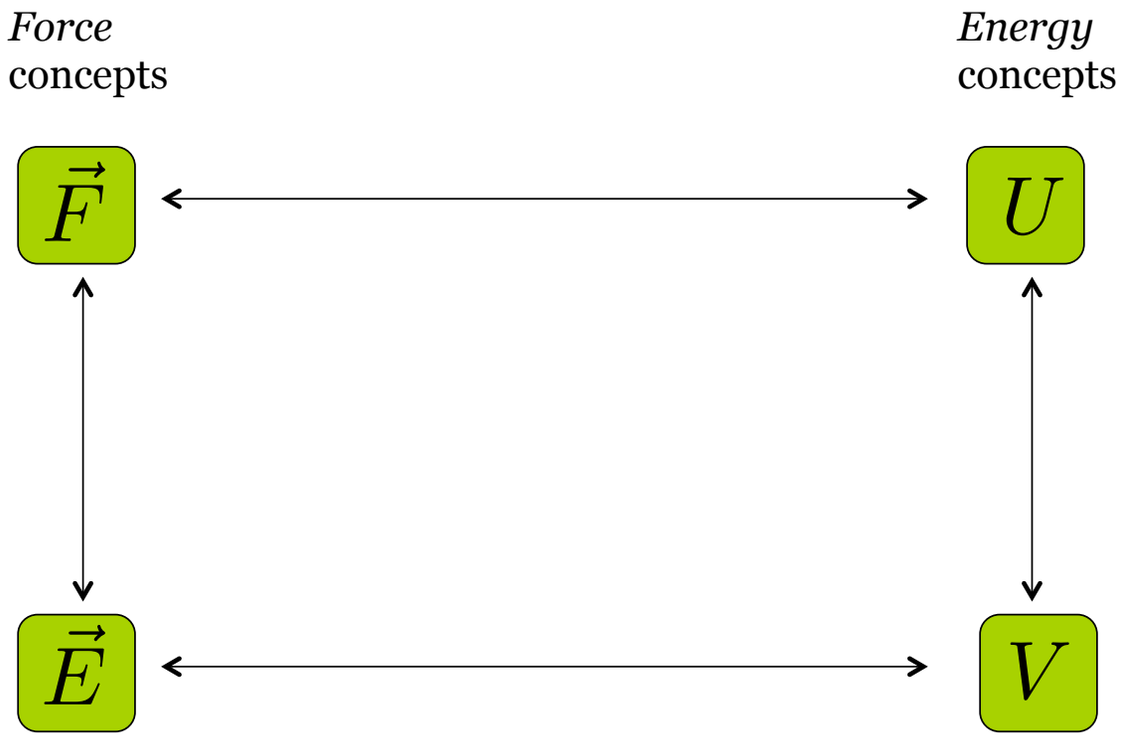

29.1: Connecting Potential & Field

- *Electric potential* and *electric field* are NOT two distinct entities!
  - But rather two *different representations* of how source charges alter space around them.

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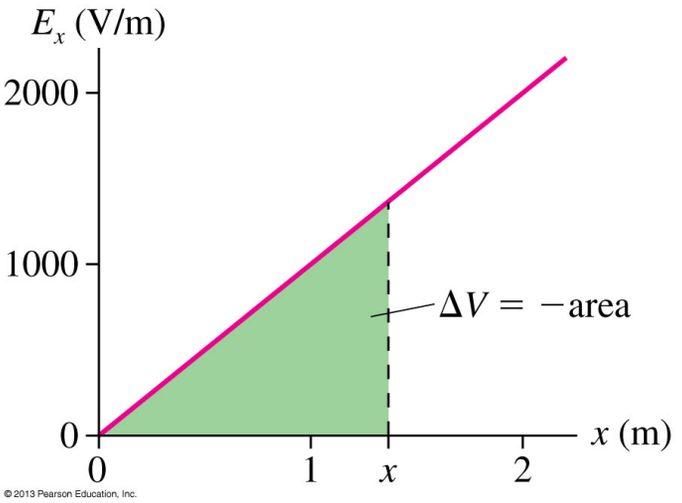
$$\Delta V = -\int_i^f \vec{E} \cdot d\vec{s}$$

- *Graphically:*
  - ΔV = *negative* of the area under the *E* vs. *s* curve between s_i & s_f

Ex. 29.1: Finding the Potential

The figure below is a graph of E_x, the x-component of the electric field, versus position along the x-axis.

Find and graph $V(x)$. Choose V = 0V at x = 0m.



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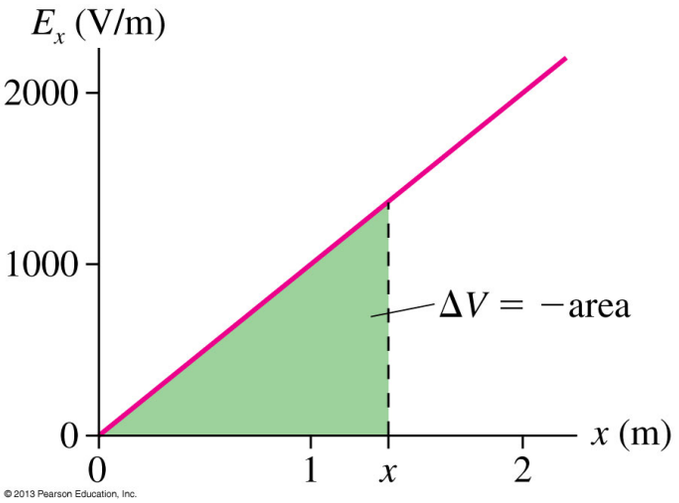
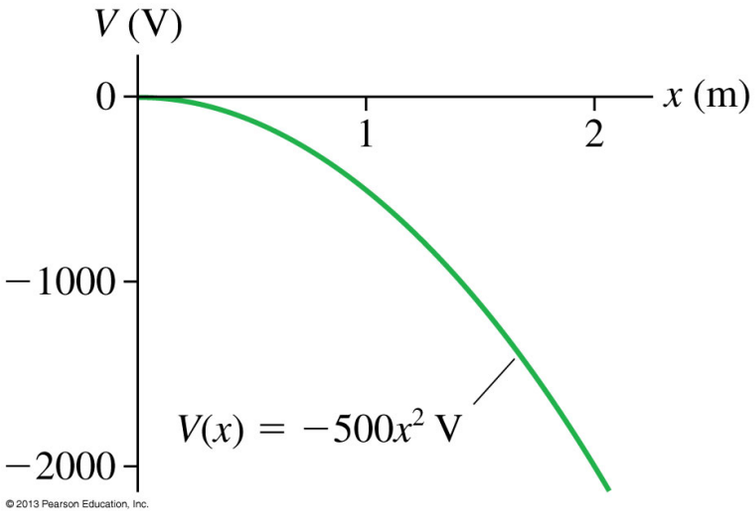
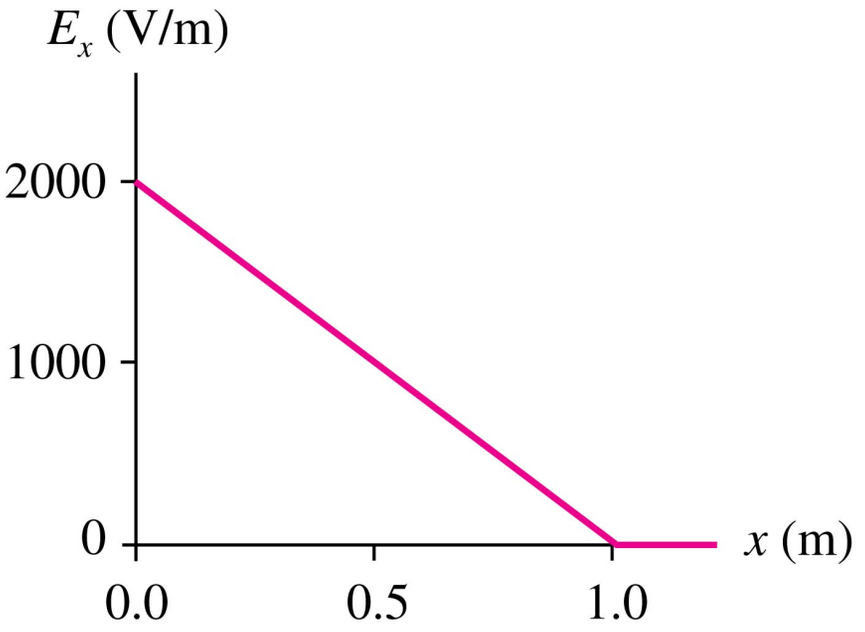




Quiz Question 1

This is a graph of the x-component of the electric field along the x-axis. Choose the potential to be zero at the origin.

What is the potential at x = 1m?



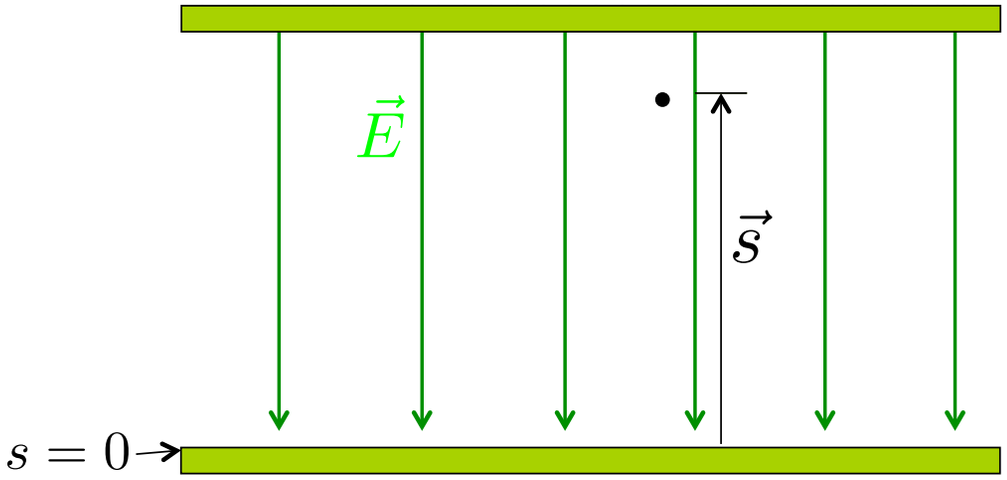
1. 2000V
2. 1000V
3. 0V
4. -1000V
5. -2000V

Connecting *V* & *E* for a point charge…

i.e. Use the *E*-field of a point charge to find its electric potential..

Ex. 29.2:
The potential of a parallel-plate capacitor

Find the electric potential inside the capacitor. Let V=0V at the negative plate.

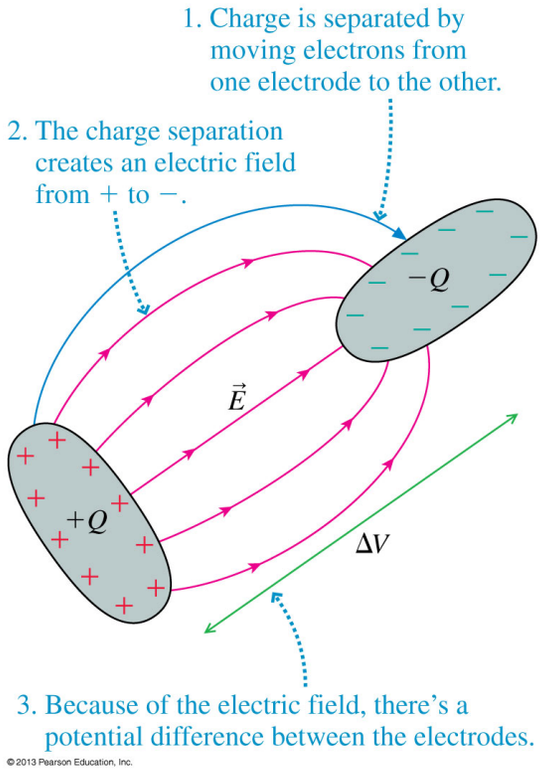


29.2: Sources of Electric Potential

A *separation of charge* creates an *electric potential difference*!

Ways to separate charge:

1. Rub feet on carpet
2. Van de Graaff generator
3. Batteries



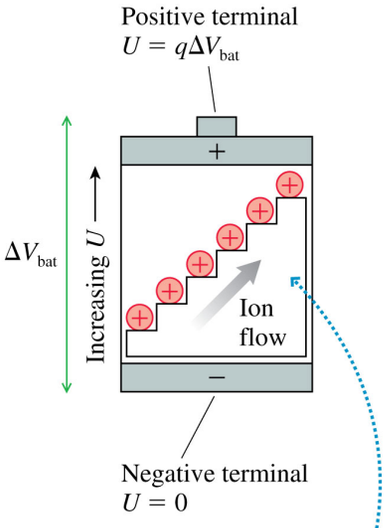
Batteries and emf

- Batteries use chemical reactions to "lift" positive charges to the positive terminal.
  - Battery provides the energy to do the work required.

- The emf of the battery is the *work done per charge*.

$$\Delta V_{bat} = \frac{W_{chem}}{q} = \mathcal{E}$$ (ideal battery)

- where ΔV_{bat} is the *terminal voltage*.



The charge escalator "lifts" charge from the negative side to the positive side. Charge q gains energy $\Delta U = q\Delta V_{\text{bat}}$.